



NYANDO MIXED SECONDARY SCHOOL
GRADE 12 MATHEMATICS
End of Term Examination

Total Marks: 100

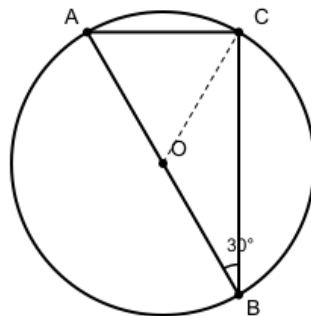
Name: Adm No: Date:

Section A (36 Marks)

Answer all the questions in this section.

1. Solve the equation $2x^2 - 5x - 3 = 0$. [3 marks]

2. Study the diagram below. O is the centre of the circle. Given that angle $ABC = 30^\circ$, find the size of angle AOC. [3 marks]



3. The mean of five numbers is 12. If four of the numbers are 8, 14, 11 and 15, find the fifth number. [3 marks]

4. Evaluate $\log_2 64 + \log_3 27$. [3 marks]

5. The area of a sector of a circle of radius 7 cm is 38.5 cm^2 . Find the angle of the sector in radians. (Take $\pi = 22/7$). [3 marks]

6. A bag contains 5 red balls and 3 blue balls. Two balls are drawn at random without replacement. Find the probability that both balls are red. [3 marks]

7. Simplify $\sqrt{50} - \sqrt{18} + \sqrt{8}$. [3 marks]

8. Find the gradient of the straight line passing through the points A(2, -1) and B(-4, 5). [3 marks]

9. The scores of 10 students are shown in the table below. Find the median score. Score: 5 6 7 8
Frequency: 2 4 3 1 [3 marks]

10. Given matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, find the determinant of A. [3 marks]

11. The volume of a sphere is $288\pi \text{ cm}^3$. Find the radius of the sphere. [3 marks]

12. A coin is tossed and a fair die is rolled. Find the probability of getting a head and a number greater than 4. [3 marks]

Section B (64 Marks)

Answer any four questions in this section.

1. The 3rd term of an arithmetic progression is 10 and the 9th term is 28. (a) Find the first term and the common difference. (b) Determine the sum of the first 12 terms. [8 marks]

2. In triangle PQR, $PQ = 7$ cm, $QR = 9$ cm and $PR = 12$ cm. (a) Calculate the angle PQR. (b) Calculate the area of triangle PQR. [8 marks]

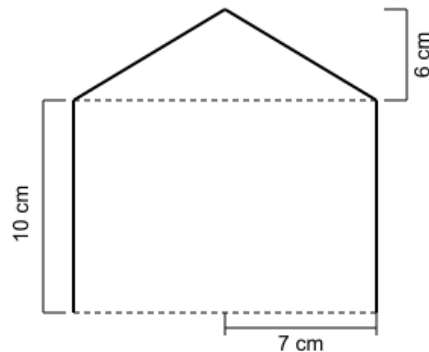
3. The ages of 50 people are given in the table below. Age (years): 20-24, 25-29, 30-34, 35-39, 40-44
Frequency: 8, 16, 12, 10, 4 (a) Calculate the mean age. (b) Calculate the standard deviation of the ages (correct to 2 decimal places). [8 marks]

4. A matrix A is given by $A = \begin{bmatrix} 2 & -1 \\ 3 & -4 \end{bmatrix}$. (a) Find the inverse of A. (b) Use the inverse to solve the simultaneous equations: $2x - y = 5$, $3x - 4y = 10$. [8 marks]

5. A circle has centre $C(2, -3)$ and passes through point $P(5, 1)$. (a) Find the equation of the circle. (b) Determine the coordinates of the points where the circle crosses the x-axis. [8 marks]

6. A box contains 4 identical white balls, 3 identical black balls and 2 identical red balls. Two balls are chosen at random without replacement. Find the probability that the two balls are of the same colour. [8 marks]

7. The diagram below shows a composite solid made up of a cylinder and a cone. Using the measurements shown in the diagram, calculate the volume of the solid. (Take $\pi = 22/7$). [8 marks]



8. Using the laws of logarithms, solve the equation $\log_2(x+1) + \log_2(x-1) = 3$. Show all steps and verify that your solution is valid. [8 marks]



MARKING GUIDE

Question	Expected answer / marking points	Marks
q1_01	$x = 3$ or $x = -1/2$. (Factorise: $(2x+1)(x-3)=0$)	3
q1_02	Angle AOC = 60° (angle at the centre is twice the angle at the circumference subtended by the same arc AC).	3
q1_03	The fifth number = $5 \times 12 - (8+14+11+15) = 60 - 48 = 12$.	3
q1_04	$\log_2 64 = 6$, $\log_3 27 = 3$. Sum = 9.	3
q1_05	$A = \frac{1}{2}r^2\theta \Rightarrow 38.5 = \frac{1}{2} \times 7^2 \times \theta \Rightarrow \theta = 38.5 \times 2 / 49 = 77/49 = 11/7$ radians.	3
q1_06	$P(RR) = (5/8) \times (4/7) = 20/56 = 5/14$.	3
q1_07	$\sqrt{50} = 5\sqrt{2}$, $\sqrt{18} = 3\sqrt{2}$, $\sqrt{8} = 2\sqrt{2}$. Therefore $5\sqrt{2} - 3\sqrt{2} + 2\sqrt{2} = 4\sqrt{2}$.	3
q1_08	$m = (5 - (-1))/(-4 - 2) = 6/(-6) = -1$.	3
q1_09	The ordered scores are 5,5,6,6,6,6,7,7,8. Median = average of 5th and 6th = $(6+6)/2 = 6$.	3
q1_10	$\det(A) = (3 \times 4) - (2 \times 1) = 10$.	3
q1_11	$V = (4/3)\pi r^3 = 288\pi \Rightarrow r^3 = 216 \Rightarrow r = 6$ cm.	3
q1_12	$P(H) = 1/2$, $P(>4) = 2/6 = 1/3$. Since independent, $P = (1/2)(1/3) = 1/6$.	3
q2_01	Let a = first term, d = common difference. $a+2d=10$ and $a+8d=28 \Rightarrow 6d=18 \Rightarrow d=3$. Then $a+6=10 \Rightarrow a=4$. Sum ₁₂ = $(12/2)(2a+11d) = 6(8+33)=246$.	8
q2_02	(a) $\cos Q = (PQ^2+QR^2-PR^2)/(2 \times PQ \times QR) = (49+81-144)/(2 \times 7 \times 9) = -14/126 = -1/9$. $Q = \cos^{-1}(-1/9) \approx 96.38^\circ$. (b) Area = $\frac{1}{2} \times 7 \times 9 \times \sin 96.38^\circ \approx 31.31$ cm ² . (Using Heron's formula also gives ≈ 31.3 cm ² .)	8
q2_03	Midpoints: 22,27,32,37,42. fx: 176,432,384,370,168 $\Rightarrow \Sigma fx=1530$, $\Sigma f=50$, mean=30.6. x-mean: -8.6,-3.6,1.4,6.4,11.4. $f(x-\text{mean})^2$: $8 \times 73.96=591.68$, $16 \times 12.96=207.36$, $12 \times 1.96=23.52$, $10 \times 40.96=409.6$, $4 \times 129.96=519.84$. $\Sigma=1752.0$. variance= $1752/50=35.04$, std ≈ 5.92 .	8
q2_04	(a) $\det = 2(-4)(-1)(3) = -8+3 = -5$. Inverse = $(1/-5)[[-4,1],[3,2]] = [[4/5,-1/5],[3/5,-2/5]]$. (b) $[x,y] = A^{-1}[5,10] = [(4/5)(5)+(-1/5)(10), (3/5)(5)+(-2/5)(10)] = [2,-1] \Rightarrow x=2, y=-1$.	8
q2_05	(a) $r^2 = (5-2)^2 + (1+3)^2 = 9+16 = 25$. Equation: $(x-2)^2 + (y+3)^2 = 25$. (b) On x-axis $y=0$: $(x-2)^2 + 9 = 25 \Rightarrow (x-2)^2 = 16 \Rightarrow x=6$ or $x=-2$. Points (6,0), (-2,0).	8
q2_06	$P(WW) = (4/9)(3/8)=12/72=1/6$; $P(BB)=(3/9)(2/8)=6/72=1/12$; $P(RR)=(2/9)(1/8)=2/72=1/36$. Sum = $6/36+3/36+1/36=10/36=5/18$.	8
q2_07	From diagram: radius = 7 cm, cylinder height = 10 cm, cone height = 6 cm. Volume = $\pi r^2 h_{\text{cyl}} + \frac{1}{3}\pi r^2 h_{\text{cone}} = \pi \times 49 \times 10 + \frac{1}{3}\pi \times 49 \times 6 = 490\pi + 98\pi = 588\pi = 588 \times (22/7) = 1848$ cm ³ .	8
q2_08	Combine logs: $\log_2[(x+1)(x-1)] = 3 \Rightarrow \log_2(x^2-1) = 3 \Rightarrow x^2-1 = 2^3 = 8 \Rightarrow x^2 = 9 \Rightarrow x = 3$ or $x = -3$. Since the argument of a logarithm must be positive, $x=-3$ gives $x+1 = -2$ and $x-1 = -4$, not allowed. Thus $x=3$. Verification: $\log_2(4)+\log_2(2)=2+1=3$. Marks for each step and for rejecting the extraneous root.	8